

Elizabeth Worcester

Brookhaven National Laboratory
Department of Physics 510E
PO Box 5000
Upton, NY 11973

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etw@bnl.gov
office: 631-344-5325
cell: 773-220-6862

Education

- **University of Chicago** Chicago, IL
Ph.D. Physics 2007
 - Advisor: Edward Blucher
 - Dissertation: Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System
- **University of California at Los Angeles** Los Angeles, CA
M.S. Physics 1998
- **Georgia Institute of Technology** Atlanta, GA
B.S. Physics 1997
 - *With Highest Honor*
 - Certificate in American Literature

Research

- **Daya Bay Reactor Neutrino Experiment** Brookhaven National Lab
Neutrino Oscillation Parameters in Reactor Antineutrino Disappearance 2011-present

Simulation and Data Analysis:

- Studying Monte Carlo simulation of scintillation in effort to improve understanding of energy linearity in Daya Bay detector.
- Developing database tables containing PMT high voltage values and cable mappings from Detector Control System (DCS) for use in determining PMT channel quality event-by-event.

Contributing to the day-to-day operation of the Daya Bay reactor neutrino experiment in Guangdong, China:

- Data quality monitoring: remote data-quality shifts, tagging of unusable data, monitoring of PMT high voltages.
- Taking onsite DAQ shifts.

- **LBNE** Brookhaven National Lab
Neutrino Oscillation Sensitivity at Long Baselines 2011-present

Using GLoBES to study the sensitivity of long-baseline neutrino oscillation measurements in the proposed Long Baseline Neutrino Experiment (LBNE), which is located at Fermi National Accelerator Laboratory (FNAL) and Sanford Underground Laboratory at Homestake.

- **ORKA** Brookhaven National Lab
Experiment Design 2011-present

Member of collaboration proposing ORKA, an experiment to precisely measure the branching ratio of $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay using the Main Injector at FNAL.

- **KTeV Analysis**
Dalitz Decay Measurements

University of Chicago
2010-2011

Dalitz decays of neutral pions in data taken by the KTeV experiment at FNAL. Challenges include updating analysis infrastructure to be compatible with current computing platforms:

- Preliminary investigation of a new analysis searching for dark photons in KTeV data; signal would appear as a narrow resonance in e^+e^- mass above the continuum π^0 Dalitz background.
- Worked with KTeV collaborators and computing experts at FNAL to preserve access to KTeV data.
- Responsible for writing and overseeing the publication of a paper on the KTeV measurement of the branching ratio of π^0 Dalitz decay.

- **KTeV Analysis**
CP Violation and CPT Symmetry in the Neutral Kaon System

University of Chicago
1999 - 2010

Made precise measurements of the direct CP violation parameter $Re(\epsilon'/\epsilon)$ and the kaon parameters Δm , τ_S , ϕ_ϵ , and $\Delta\phi$ using data from the KTeV experiment. Important aspects of the analysis are precise calibration of particle detectors, measurement of detector acceptance using a detailed Monte Carlo simulation, and careful evaluation of systematic uncertainties:

- Responsible for calibration of the regenerator, the photon veto detectors, and the CsI calorimeter.
- Responsible for development of improved simulation and reconstruction techniques for electromagnetic showers in the CsI calorimeter.
- Responsible for software development, data analysis, and evaluation of systematic uncertainties for the half of the analysis studying kaon decays to neutral pions.
- Worked in close collaboration with Prof. Edward Blucher and two senior scientists on the full analysis.

- **KTeV 1999 Run**
Detector Maintenance and Data Acquisition

UCLA
1998 - 2000

- Responsible for re-commissioning and maintenance of the regenerator and photon veto detectors.
- 24-hour on-call expertise for the regenerator and photon veto systems.
- Responsible for data-taking and monitoring of the KTeV experiment during frequent shifts in the experiment control room.

- **MACHO/GMAN**
Microlensing Observations

University of Notre Dame
1997 - 1998

- Telescope operator for follow-up observation of microlensing events for the MACHO/GMAN collaboration using the 74-inch telescope at Mt. Stromlo Observatory in Canberra, Australia.
- Contributed to development of analysis software used to study microlensing events.

- **CTIO REU Program**
Supernova Studies

Cerro Tololo Inter-American Observatory
1996

- Responsible for analysis of infrared photometry follow-up observations of supernova 1987a.
- Participated in High-z Supernova Search to identify Type 1a supernovae at the CTIO 4-m telescope.

Teaching

- **Teaching Assistant**

Teaching Assistant responsible for leading discussion sections with an emphasis on problem solving; holding office hours for individual student assistance; grading homework and providing homework solution sets; proctoring and grading exams.

- **Elementary Particle Physics**

UCLA
Winter 1998

- **Introduction to Electromagnetism**

UCLA
Fall 1997

- * Additional responsibility giving one-on-one oral exams to visually impaired student.

- **Calculus of Multivariable Integration**

Georgia Tech
Fall 1996

- * Additional responsibility staffing drop-in help center in the mathematics department.

Presentations

- *ORKA: The Golden Kaon Experiment*

- **BEACH 2012**

Wichita, KS
July 2012

- **Users' Meeting, FNAL**

Batavia, IL
June 2012

- **Project X Physics Study, FNAL**
Physics Breadth

Batavia, IL
June 2012

- *Observation of Electron Antineutrino Disappearance at Daya Bay*

- **HEP Seminar, University of Pennsylvania**

Philadelphia, PA
April 2012

- *KTeV Measurement of $Re(\epsilon'/\epsilon)$ and Other Kaon Parameters*

- **Project X Physics Study, FNAL**
The KTeV CsI Calorimeter

Batavia, IL
June 2012

- **Particle Physics Seminar, BNL**

Upton, NY
August 2011

- **Division of Particles and Fields**

Detroit, MI
July 2009

- **Heavy Quarks and Leptons**

Melbourne, Australia
June 2008

- **HEP Seminar, University of Chicago**

Chicago, IL
April 2008

- **Wine and Cheese Seminar, FNAL**

Batavia, IL
February 2008

- **Rencontres de Blois**

Blois, France
June 2002

- *Infrared Photometry of SN1987a*
 - American Astronomical Society Poster

Toronto, Canada
January 1997

Selected Publications

- E.T. Worcester for the ORKA Collaboration, *ORKA: The Golden Kaon Experiment*, Proceedings of BEACH 2012, Wichita, KS, 2012, arXiv:1211.4883.
 - E. Abouzaid, et al, *Precise Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System*, Phys. Rev. D 83, 2011, arXiv:1011.0127v2 [hep-ex].
 - E.T. Worcester, *The Final Measurement of Epsilon'/Epsilon from KTeV*, Proceedings of DPF-2009, Detroit, MI, 2009, arXiv:0910.3160v1 [hep-ex].
 - E.T. Worcester, *The Final Measurement of Epsilon'/Epsilon from KTeV*, Proceedings of Heavy Quarks and Leptons, Melbourne, 2008, arXiv:0909.2555v1 [hep-ex].
 - E.T. Worcester, *Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System*, Ph.D. thesis, The University of Chicago, December 2007.
 - A. Alavi-Harati, et al, Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System, Phys. Rev. D 67, 2003, arXiv:hep-ex/0208007v1.
 - E. Turner, in *Matter-Antimatter Asymmetry: Proceedings of the XIVth Rencontres de Blois*, pp 313-316, Blois, France, 2002.
 - Bennett,D.P., et al., *Gravitational microlensing evidence for a planet orbiting a binary star system*, Nature, Volume 402, Issue 6757, pp 57-59, 1999.
 - Turner,S.E., et al, Bulletin of the American Astronomical Society 1996, Volume 28, Number 4.
 - Garnavich,P., et al, 1996 International Astronomical Union Circular 6358.

Awards & Honors

Employment History

- Postdoctoral Research Associate Brookhaven National Lab
2011-present
 - Part-time Research Consultant University of Chicago
2010-2011
 - Stay-at-home mother No employer
2007-2010
 - Graduate Research Assistant University of Chicago
2002-2007

- Graduate Research/Teaching Assistant

UCLA
1997-2002

- Telescope Operator/Research Assistant

University of Notre Dame
1997

Personal Information

Full Name: Elizabeth Turner Worcester

Maiden Name: Shirley Elizabeth Turner (before August 24, 2002)

Date of Birth: September 23, 1975

Place of Birth: Berlin, Vermont

Home address: 8 Ocean Avenue, Center Moriches, NY 11934

Full Publication List

1. E.T. Worcester for the ORKA Collaboration, *ORKA: The Golden Kaon Experiment*, Proceedings of BEACH 2012, Wichita, KS, 2012, arXiv:1211.4883.
2. F.P. An, et al, *Improved Measurement of Electron Antineutrino Disappearance at Daya Bay*, arXiV:1210.6327, 2012.
3. F. DeJongh, et al, *Electromagnetic Calorimetry in Project X Experiments*, <https://indico.fnal.gov/getFile.py?access?contribId=183&sessionId=17&resId=0&materialId=paper&confId=5276>, 2012.
4. J Goon, et al, *Conceptual Design Report developed for the Water Cherenkov Detector (WCD) option for the far detector of the Long Baseline Neutrino Experiment*, arXiv1204.2295, 2012.
5. J.L. Hewett, et al, *Fundamental Physics at the Intensity Frontier*, arXiV:1205.2671, 2012.
6. M. Bishai, et al, *Neutrino Oscillations in the Precision Era*, arXiv1203.4090, 2012.
7. F.P. An, et al, *Observation of electron-antineutrino disappearance at Daya Bay*, Phys.Rev.Lett. 108, 2012.
8. E. Abouzaid, et al, *Search for the rare decays $K_L \rightarrow \pi^0\pi^0\mu^+\mu^-$ and $K_L \rightarrow \pi^0\pi^0X^0 \rightarrow \pi^0\pi^0\mu^+\mu^-$* , Phys.Rev.Lett. 107, 2011.
9. E. Abouzaid, et al, *Precise Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System*, Phys.Rev.D 83, 2011.
10. E. Abouzaid et al., V. Bernard, M. Oertel, E. Passemar, J. Stern, *Dispersive analysis of $K_{\{L\}}\mu 3$ and $K_{\{L\}}e3$ scalar and vector form factors using KTeV data*, Phys.Rev.D 81, 2010.
11. E.T. Worcester, *The Final Measurement of Epsilon'/Epsilon from KTeV*, Proceedings of DPF-2009, Detroit, MI, 2009.
12. E.T. Worcester, *The Final Measurement of Epsilon'/Epsilon from KTeV*, Proceedings of Heavy Quarks and Leptons, Melbourne, 2008.
13. E. Abouzaid, et al., *Detailed Study of the $KL \rightarrow 3\pi 0$ Dalitz Plot*, Phys.Rev.D 78:032009, 2008.
14. E. Abouzaid, et al., *Final Results from the KTeV Experiment on the Decay $K(L) \rightarrow \pi 0$ gamma*, Phys.Rev.D 77:112004, 2008.
15. E. Abouzaid, et al., *Determination of the Parity of the Neutral Pion via the Four-Electron Decay*, Phys.Rev.Lett. 100:182001, 2008.

16. E. Abouzaid, et al., *Search for lepton flavor violating decays of the neutral kaon*, Phys.Rev.Lett. 100:131803, 2008.
17. E. Abouzaid, et al., *Search for the Rare Decay $K(L) \rightarrow \pi^0 \pi^0 \gamma$* , Phys.Rev.D 78:032014, 2008.
18. E.T. Worcester, *Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System*, Ph.D. thesis, The University of Chicago, December 2007.
19. E. Abouzaid, et al., *Measurement of the Decay $K(L) \rightarrow \pi^0 e^+ e^- \gamma$* , Phys.Rev.D 76:052001, 2007.
20. E. Abouzaid, et al., *First observation of $K(L) \rightarrow \pi^+ e^- \nu e^- \gamma$* , Phys.Rev.Lett. 99:081803, 2007.
21. E. Abouzaid, et al., *Measurements of the Decay $K(L) \rightarrow e^+ e^- \gamma$* , Phys.Rev.Lett. 99:051804, 2007.
22. E. Abouzaid, et al., *Measurement of the rare decay $\pi^0 \rightarrow e^+ e^-$* , Phys.Rev.D 75:012004, 2007.
23. E. Abouzaid, et al., *Xi^0 and anti- Xi^0 Polarization Measurements at 800-GeV/c*, Phys.Rev.D 75:012005, 2007.
24. E. Abouzaid, et al., *Improved $K(L) \rightarrow \pi^+ e^- \nu$ form factor and phase space integral with reduced model uncertainty*, Phys.Rev.D 74:097101, 2006.
25. E. Abouzaid, et al., *Measurement of direct photon emission in the $K(L) \rightarrow \pi^+ \pi^- \gamma$ decay mode*, Phys.Rev.D 74:032004, 2006.
26. E. Abouzaid, et al., *A Measurement of the K^0 Charge Radius and a CP Violating Asymmetry Together with a Search for CP Violating E1 Direct Photon Emission in the Rare Decay $K^0 \rightarrow \pi^+ \pi^- e^+ e^-$* , Phys.Rev.Lett. 96:101801, 2006.
27. E. Abouzaid, et al., *Observation of the decay $Xi^0 \rightarrow \Sigma^+ \mu^- \bar{\nu}_\mu$* , Phys.Rev.Lett. 95:081801, 2005.
28. T. Alexopoulos, et al., *Measurements of the branching fractions and decay distributions for $K(L) \rightarrow \pi^+ \mu^- \nu$ and $K(L) \rightarrow \pi^+ e^- \nu$* , Phys.Rev.D 71:012001, 2005.
29. T. Alexopoulos, et al., *Measurements of semileptonic $K(L)$ decay form-factors*, Phys.Rev.D 70:092007, 2004.
30. T. Alexopoulos, et al., *Measurements of $K(L)$ branching fractions and the CP violation parameter $\eta_{e\mu}$* , Phys.Rev.D 70:092006, 2004.
31. T. Alexopoulos, et al., *A Determination of the CKM parameter V_{us}* , Phys.Rev.Lett. 93:181802, 2004.
32. A. Alavi-Harati, et al., *Search for the rare decay $K(L) \rightarrow \pi^0 e^+ e^-$* , Phys.Rev.Lett. 93:021805, 2004.
33. A. Alavi-Harati, et al., *Measurements of the decay $K(L) \rightarrow e^+ e^- \mu^+ \mu^-$* , Phys.Rev.Lett. 90:141801, 2003.
34. A. Alavi-Harati, et al., *Measurements of Direct CP Violation, CPT Symmetry, and Other Parameters in the Neutral Kaon System*, Phys.Rev.D 67:012005, 2003.
35. A. Alavi-Harati, et al., *Search for the $K(L) \rightarrow \pi^0 \pi^0 e^+ e^-$ decay in the KTeV experiment*, Phys.Rev.Lett. 89:211801, 2002.
36. E. Turner, in *Matter-Antimatter Asymmetry: Proceedings of the XIVth Rencontres de Blois*, pp 313-316, Blois, France, 2002.
37. A. Alavi-Harati, et al., *A Measurement of the $K(L)$ charge asymmetry*, Phys.Rev.Lett. 88:181601, 2002.
38. A. Alavi-Harati, et al., *Radiative decay width measurements of neutral kaon excitations using the Primakoff effect*, Phys.Rev.Lett. 89:072001, 2002.

39. A. Alavi-Harati, et al., *Measurement of the branching ratio and form-factor of $K(L) \rightarrow mu+ mu- gamma$* , Phys.Rev.Lett 87:071801, 2001.
40. A. Alavi-Harati, et al., *Branching ratio measurement of the decay $K(L) \rightarrow e+ e- mu+ mu-$* , Phys.Rev.Lett. 87:111802, 2001.
41. A. Alavi-Harati, et al., *A New measurement of the radiative $K(e)3$ branching ratio and photon spectrum*, Phys.Rev.D 64:112004, 2001.
42. A. Alavi-Harati, et al., *First measurement of form-factors of the decay $Xi0 \rightarrow Sigma + e- anti-nu(e)$* , Phys.Rev.Lett. 87:132001, 2001.
43. A. Alavi-Harati, et al., *Measurements of the rare decay $K(L) \rightarrow e+ e- e+ e-$* , Phys.Rev.Lett 86:5425-5429, 2001.
44. A. Alavi-Harati, et al., *A Measurement of the branching ratio and asymmetry of the decay $Xi0 \rightarrow Sigma0 gamma$* , Phys.Rev.Lett 86:3239-3243, 2001.
45. A. Alavi-Harati, et al., *First observation of the decay $K(L) \rightarrow pi0 e+ e- gamma$* , Phys.Rev.Lett 87:021801, 2001.
46. Bennett, D.P., et al., *Gravitational microlensing evidence for a planet orbiting a binary star system*, Nature, Volume 402, Issue 6757, pp 57-59, 1999.
47. Rhie, S.H., et al., Bulletin of the American Astronomical Society 1997, Volume 29, Number 5.
48. Becker, A.C., et al., 1997 International Astronomical Union Circular 6720.
49. Turner,S.E., et al., Bulletin of the American Astronomical Society 1996, Volume 28, Number 4.
50. Garnavich, P., et al., 1996 International Astronomical Union Circular 6358.
51. Garnavich, P., et al., 1996 International Astronomical Union Circular 6332.